Remarks

Claims 1-32 are pending in the application. Claims 7-9, 13, 14, and 26-32 are withdrawn from consideration. Claims 1-6, 10-12 and 15-25 stand rejected.

(a) Claims 1, 3-4,15,17-18, 20 and 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over WO 91/13552 to Tate in view of U.S. Patent No. 4,975,110 to Puritch.

(b) Claims 1-6, 10-12, and 15-25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,246,716 to Sedum et al. in view of U.S. Patent No. 5,143,718 to Bar-Shalom, and further in view of U.S. Patent No. 4,975,110 to Puritch et al.

(a) Rejections based on Tate, in view of Puritch et al.

The Office Action finds that Tate teaches a fungicidal composition comprising chemo-tactic ingredients to combat fungal infections of plants. Tate's chemo-tactic ingredients can include amino acids and fatty acids. The Office Action further finds that Puritch teaches a pesticide comprising a ready-to-use emulsion containing a fatty acid and an emulsifier. In view of these findings, the Office Action finds that it would have been obvious to one skilled in the art at the time Applicant's invention was made to combine the teachings of Tate and Puritch to arrive at Applicant's claimed invention. According to the Office Action, Puritch's emulsifier would have been added to Tate's formulation in a routine effort to optimize the Tate formulation. Applicant respectfully suggests that the determination of the scope of the prior art with regard to the references cited was not fully carried out leading to errors in (a) the ascertainment of the differences between the prior art and Applicant's pending claims and (b) what one skilled in the art would expect from the combination of Tate and Puritch et al.

Tate's Problem/Purpose for adding Chemo-tactic Components

According to Tate, at page 2, first full paragraph, the problem being solved by his invention involved the following:

> A major difficulty with the known art is the presence of sodium or chlorine or other anions such as hydroxide or sulphate within the copper based fungicides that restrict microbial (i.e. fungal) activity. The presence of these anionic molecules, being largely of a negatively chemotaxic nature, results in a biochemical inhibition of the surface microflora on the plant surface. The effect of this is to reduce the effectiveness of the applied copper as the resting innoculum is forced to hibernate through the unfavorable conditions.

At page 2, just before "Disclosure of Invention", Tate describes his solution to this problem:

> No copper based or other types of fungicides are specifically designed to positively alter plant surface conditions as a means of maximising the eradicant effect of the copper (II') ions, or other active ingredients that are present. Previously, no attempt has been made to control the fungal activity by encouraging spore germination in the presence of a fungistat.
>
> Thus, there is a need for an improved copper based or other formulation of a fungicide which would additionally allow incorporation of substances to increase fungal activity, specifically by encouraging fungal spore germination and hence enabling greater control of the infection-.

It is clear that the purpose of adding a chemo-tactic component to the Tate formulation is to encourage spore germination and resultant fungal growth so that the copper fungicide can be incorporated into the microorganism causing its death.

Under "Disclosure of Invention", Tate identifies specific compound types that can function as positive chemo-tactic components:

> Disclosure of Invention
>
> The present invention provides a fungicidal composition comprising a fungicide such as a copper (II) based fungicide, together with one or more substances that produce a positive myco-chemotaxic response from the target pathogen. Some examples of these types of materials are: organic acids such as citric or malic acids; amino acids such as glutamic or aspartic acids; fatty acids such as oleic or palmitic acids and/or aldehyde derivatives of these acids. Also saccharides or polysaccharides can be used, such as sucrose *or* galactose, or pectic, or glycoside derivatives, or polymeric materials that have components composed of saccharides. Other such substances, or combinations of these and other materials can be used, and can be changed according to the crop and type of infection.

In Tate's formulations, the carboxylic acids are present to promote spore germination and fungal growth. Only when the copper fungicide is present is the composition expected to provide fungicidal activity. Otherwise fungal growth is promoted. Furthermore, Tate does not suggest nor imply in his invention that carboxylic acids, alone, have fungicidal activity...

The Herbicide taught by Puritch et al.

Puritch teaches a herbicide which is a micro-emulsion comprising a fatty acid component and a surfactant. The Puritch herbicides appear to be effective against both annual weeds and perennial weeds (See column 6, lines 29-39). One skilled in the art of pesticides would see the Puritch patent as teaching that the application of an emulsion containing a fatty acid to plants would be expected to kill plants contacted.

The word "fungicide" is mentioned only once by Puritch et al. At column 1, second full paragraph, Puritch et al. provide a definition for the term "pesticide". According to Puritch et al.,

the "…term 'pesticide' is used herein in a generic sense and includes insecticides, fungicides, herbicides and miticides." After defining the term, Puritch et al. proceed in the following paragraph to mention uses that include insecticide and herbicide applications. Except for the definition of "pesticide", the word "fungicide" doesn't appear again in Puritch et al. A broad definition of the term "pesticide" that includes fungicides followed by specific examples of pesticides that include insecticide and herbicide applications simply does not rise to the level of a disclosure of fatty acids or their salts as fungicides.

The Combination of Tate in view of Puritch et al.

According to the Office Action, it would have been obvious to have combined the teaching of Tate and Puritch et al. to arrive at the instant invention. As noted above, Tate teaches that his chemo-tactic components increase spore germination and fungal growth in the absence of a copper fungicide. Without the copper fungicide, the chemo-tactic combination would be expected to facilitate fungal growth and increase harm to the plant. Puritch et al. teach that the application of a microemulsion of a fatty acid to plants will kill them. One skilled in the art could only conclude that addition of Puritch's surfactant to Tate's chemo-tactic components (including a fatty acid) would produce a microemulsion containing a fatty acid, Puritch's herbicide, which would kill any plant treated with the combination. Tate's chemo-tactic components, Puritch's herbicide or Tate's chemotactic components with Puritch's surfactant would all be expected to harm any plant to which it was applied, either by increasing fungal growth or killing the plant through its herbicidal activity. According to MPEP 2143.01 III, "The mere fact that references can be combined or modified does not render the resultant combination obvious **unless **>the results would have been predictable to one of ordinary skill in the art**. KSR International Co. v. Teleflex Inc., 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007)" (Emphasis added). Clearly, it would not be predictable to one of ordinary skill that a plant fungicide would result from the combination of (a) components taught to enhance fungal growth and (b) a component that when combined with Tate's fatty acids provides a herbicide. In fact the proposed combination specifically provides the Puritch et al. herbicide composition (an emulsion containing a fatty acid). Please see paragraph 6 of Dr. Coleman's Declaration for support of this position.

(b) Rejections based on Sedum et al., in view of Bar Shalom, and further in view of Puritch et al.

The Office Action found that Sedum et al. teaches compositions containing a fatty acid metal salt that can protect plants from fungal infections. The Office Action finds, however, that a carboxylic acid different from the fatty acid was missing from Sedum et al. The Office Action finds the missing carboxylic acid in the Bar Shalom patent directed to an antiperspirant composition. Because neither, Sedum et al. or Bar Shalom discloses an emulsifier, the Office Action finds the missing emulsifier in the Puritch et al. patent. Although the needed elements can be found in the cited references, their combination goes against the wisdom taught by the very cited references as understood by one skilled in the relevant art. The references will first be considered separately and their combination considered.

The Sedum et al. Composition

The Sedum reference (U.S. Patent No. 5,246,716) teaches a fungicidal composition that can include a fatty acid, but the composition lacks an organic carboxylic acid that is different from the fatty acid required. However, based on a careful reading of Sedum et al., it's clear that the addition of certain kinds of additional components can increase the solubility of the salt thus increasing the compositions phytotoxicity, enhancing the undesirable phytotoxic or herbicidal properties of the fatty acid component. At col. 6, lines 5-12, Sedum et al. indicates the following:

> The low solubility in water of the fatty acid metal salts also contributes to the low phytotoxicity of the formulation. Low phytotoxicity is essential for the composition as it is applied to plants in order to kill pathogenic fungi, or to prevent their infestation of the plant. Compositions which are phytotoxic as well as fungicidal are not desirable.

According to Sedum et al., phytotoxicity is avoided by requiring the fatty acid to be in the form of an insoluble metal salt. Anything that increases the concentration of the fatty acid anion causes an increase in the composition's phytotoxicity, making it unsuitable for use as a plant fungicide. One skilled in the relevant art would understand that the addition of an additional carboxylic acid would cause an equilibrium to be established between the fatty acid salt and the additional carboxylic acid wherein increased amounts of the fatty acid anion would become soluble. As a result, the composition's phytotoxicity would be enhanced.

The Bar Shalom Composition

Bar-Shalom teaches a composition containing Aluminum chloride and an aluminum salt of at least one organic carboxylic acid dispersed in a suitable carrier (See Abstract of U.S. Patent No. 5,143,718). Carboxylic acids disclosed include fatty acids. The active ingredient in Bar-Shalom's antiperspirants is $AlCl_3$, a type of aluminum halide. The use of basic aluminum halides, particularly chlorides, as effective antiperspirant compounds is well known. Basic aluminum halides are complex structures made up of mixtures of polymeric and monomeric species of various sizes and molecular structures, depending upon their Al:halide ratio, together with varying amounts of bound or coordinated water (USPTO Application No. 20070020211).

With regard to his formulations, Bar Shalom teaches at column 2, lines 28-40 that the formulations should be anhydrous stating:

> In order to prevent premature reaction of the aluminum chloride with water, it is preferred that the composition be anhydrous. This is in particular obtained by using a carrier system which is anhydrous or has no available water so that aluminium chloride does not undergo hydrolysis to aluminium hydroxychloride and hydrogen chloride. The term "no available water" is intended to mean that the water present in the formulation is not able to solvate the aluminium salts, either because the water is present in too small an amount, or because the water is bound too strongly by another component in the composition.

The formulations taught are meant to be anhydrous and not aqueous formulations.

Bar-Shalom's primary reason for including a carboxylic acid into his formulation is provided at column 2, lines 7-13.

> The idea behind the invention is to exploit the high acidity of hydrogen chloride by allowing the hydrogen chloride to react with the salt of the weaker acid with no pK value below 2.5, the weaker acid then, according to well known principles, being liberated from the salt by the stronger hydrochloric acid to give the free weaker acid and a chloride instead. The fact that an aluminium salt of the weaker acid is used has the advantage of resulting in the formation of a further amount of aluminium hydroxychloride, thereby resulting in a further antiperspirant effect.

The primary purpose of the carboxylic acid salt is to reduce the acidity and skin irritation generated by hydrogen chloride, a byproduct of $AlCl_3$ when exposed to water.

Bar-Shalom further indicates, as a secondary consideration, that the organic acids used can further display biological properties including antimicrobial, antiperspirant, deodorant, anti-inflammatoric, emollient, anesthetic, hemostatic, astringent, etc. With regard to antifungal properties, he indicates that,

> Thus if the acid used in the composition of the invention has antifungal properties, the composition of the invention could be useful in therapy or prophylactic treatment of *Tinea pedis*, also known as "athlete's foot". This affliction is extremely common and is associated with sweating, and the maceration of the skin by the sweat facilitates the infection and makes it more difficult to treat. Even in person with "normal" sweating it is desirable to reduce the amount of perspiration when treating the fungi. (column 2, lines 58-68)

In summary, Bar Shalom teaches that all of his antiperspirant formulations containing salts of carboxylic acids are anhydrous or have no available water. With regard to the possible use of a formulation containing a carboxylic acid to treat a fungal infection such as athlete's foot, the importance of minimizing moisture in the form of perspiration is important. All antiperspirant and antifungal formulations taught by Bar Shalom are anhydrous and no antifungal properties related to plant growth are mentioned,

The Herbicide taught by Puritch et al.

(See above, pages 3-4)

The Combination of Sedum in view of Bar Shalom and further in view of Puritch et al.

The combination of Sedum and Bar Shalom suggested by the Office Action results in Sedum's salt of a fatty acid in combination with an additional carboxylic acid. Because Sedum teaches that the salt of the fatty acid will have low solubility in water and that increased levels of a soluble form of the fatty acid anion increases phytotoxicity and introduces herbicidal properties, one skilled in the art would understand not to make the suggested combination. That is, the addition of another carboxylic acid would establish equilibriums between the salts of the fatty acid and the other carboxylic acid, increasing the amount of dissolved fatty acid anion. Because the increased phytotoxicity would render the proposed modification of Sedum unsatisfactory for its intended purpose, "…there is no suggestion or motivation to make the proposed modification" (See MPEP 2143.01V). Moreover, Bar Shalom further teaches an anhydrous formulation. One skilled in the art would not expect fungicidal properties limited to anhydrous conditions

to necessarily be efficacious in an aqueous system. Finally, one skilled in the art would not expect a fungicide suitable for treating athletes foot to function as a plant fungicide.

The combination of Sedum in view of Bar Shalom, further in view of Puritch et al., not only doesn't make the combination more likely, Puritch et al. makes the combination unworkable. Puritch et al. describes a microemulsion of a fatty acid that has herbicidal properties. The proposed combination contains a fatty acid (from either Sedum or Bar Shalom), and an emulsifier (from Puritch et al.). According to Puritch et al., this combination is a herbicide rendering the proposed modification of Sedum, in view of Bar Shalom unsatisfactory as a plant fungicide. Because the combination is unsatisfactory for its intended purpose, "…there is no suggestion or motivation to make the proposed modification" (See MPEP 2143.01V). Further, because a herbicide is not feasible or practical as a plant fungicide, the proposed combination actually teaches away from applicant's claimed invention. Please see paragraphs 7 and 8 of Dr. Coleman's Declaration for support of the positions taken above.

(c) Had a prima facie case of obviousness been presented, the showing of an unexpected result overcomes the obviousness rejection

Applicant's combination of a fatty acid and a different carboxylic acid defined in claim 1 has provided unexpected superior fungicidal properties compared to a fatty acid alone or a carboxylic acid alone. Several sets of comparison data are provided, in Tables 4-6, demonstrating that formulations containing the combination of a fatty acid (caprylic acid) and another carboxylic acid (glycolic acid) provide substantially greater protection against a fungus combination that attacks fruit, than formulations containing the fatty acid alone or the carboxylic acid alone.

Table 4, reproduced below from Applicant's specification provides data from Example 4, showing that treatment of strawberries infected with a combination of *Botrytis cinerea* and *Rhizopus* treated with water (#1); glycolic acid/water (#2); a combination of caprylic acid/glycolic acid/water/emulsifier/mineral oil (#3); and caprylic acid/water/emulsifier/mineral oil (#4). The level of infection was determined on days 3, 4, 5, 6, and 7 after treatment. Glycolic acid/water relative to water provided substantially no inhibition of the fungal combination. Caprylic acid/water/emulsifier/mineral oil provided some inhibition that diminished significantly by day 7. However, the combination of caprylic acid/glycolic

acid/water/emulsifier/mineral oil provided 5 times the inhibition on day 3 and by day 7 still provided nearly twice the inhibition as caprylic acid/water/emulsifier/mineral oil or the additive inhibition derived from caprylic acid/water/emulsifier/mineral oil and glycolic acid/water. This increased level of inhibition derived from a combination of a fatty acid (caprylic acid) and a carboxylic acid different from the fatty acid (glycolic acid), water, an emulsifier and mineral oil was surprising and unexpected in view of the prior art cited and what one skilled in the art would have expected.

TABLE 4

Group	Treatment Solution	Infected berries (% of total) determined at the specified days after treatment (DAT)				
		Day 3	Day 4	Day 5	Day 6	Day 7
1.	Water	70%	85%	100%	100%	100%
2.	0.35% glycolic acid	75%	90%	100%	100%	100%
3.	0.35% glycolic acid and 0.35% caprylic/0.1% 6915[1]/0.05% mineral oil	5%	15%	20%	30%	40%
4.	0.35% caprylic acid/0.1% 6915[1]/0.05% mineral oil	25%	50%	60%	65%	75%

[1]Cognis Emsorb 6915 (emulsifier)

Table 5, similarly reproduced below from Applicant's specification, provides data from Example 5 and illustrates the results from a similar test using the same fungal combination and a different formulation of the fatty acid and the carboxylic acid different from the fatty acid. The results from Example 5, show that a combination (#3) of a fatty acid and a carboxylic acid different from the fatty acid can provide nearly 20 times the level of inhibition on the 4th day after treatment compared to the fatty acid alone (#4), the carboxylic acid alone (#2), or the additive inhibitions of the fatty acid alone, and the carboxylic acid alone. This increased level of inhibition of fungal growth was surprising and completely unexpected in view of the prior art cited and what one skilled in the art would have expected. The formulations in Example 5 were similar to those in Example 4, except for the level of caprylic acid.

TABLE 5

Group	Treatment Solution	Infected berries (% of total) on days after treatment		
		Day 2	Day 3	Day 4
1.	Water	75%	90%	100%
2.	0.35% glycolic acid	70%	95%	100%
3.	0.35% glycolic acid + 0.70% caprylic acid/0.20% 6915[1]/ 0.10% mineral oil	0%	0%	5%
4.	0.70% caprylic acid/ 0.20% 6915[1]/0.10% mineral oil	25%	60%	95%

[1]Cognis Emsorb 6915 (emulsifier)

In Example 6, the same fungal combination was tested against water (#1), caprylic acid/water/emulsifier/mineral oil (#2), caprylic acid/glycolic acid/water/ emulsifier/mineral oil (#3), and caprylic acid/potassium sorbate/water/emulsifier/mineral oil (#4). Infection was apparent on day 2 for fruit treated with water and with caprylic acid/water/emulsifier/mineral oil, whereas fruit treated with the caprylic acid/glycolic acid/water/emulsifier/mineral oil combination and with the caprylic acid/potassium sorbate/water/emulsifier/mineral oil combination, the fruit remained free of evidence of infection on days 2 and 3. By day 9, treatment with the caprylic acid/glycolic acid/water/emulsifier/mineral oil combination (#3) and with the caprylic acid/potassium sorbate/water/emulsifier/mineral oil combination (#4) reduced the number of infected berries by about 6- and 4-fold, respectively, compared to the treatment with caprylic acid/water/emulsifier/mineral oil alone (#2). Or, as stated differently, there were 16, 95 and 68% control or inhibition of fungal infection at day 9 by #2, 3 and 4, respectively. This increased level of inhibition of fungal growth by a combination of caprylic acid and a carboxylic acid different from caprylic acid was surprising and completely unexpected in view of the prior art cited and what one skilled in the art would have expected. Please see paragraphs 9 through 13 of Dr. Coleman's Declaration for support of the positions taken above.

TABLE 6

Group	Treatment Solution	Infected berries (% of total treated berries): days after treatments				
		Day 2	Day 3	Day 5	Day 7	Day 9
1.	Water	60%	75%	95%	95%	95%
2.	0.7% caprylic acid/0.2% 6915[1]/0.1% mineral oil	5%	25%	55%	75%	80%
3.	0.7% caprylic acid/0.2% 6915[1]/0.1% mineral oil and 0.35% glycolic acid	0%	0%	0%	0%	5%
4.	0.7% caprylic acid/0.2% 6915[1]/0.1% mineral oil and 0.35% potassium sorbate	0%	0%	15%	25%	30%

[1]Cognis Emsorb 6915 (emulsifier)

According to *In re Soni*:

One way for a patent applicant to rebut a *prima facie* case of obviousness is to make a showing of "unexpected results," i.e., to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected. The basic principle behind this rule is straightforward – that which would have been surprising to a person of ordinary skill in a particular art would not have been obvious. The principle applies most often to the less predictable fields, such as chemistry, where minor changes in a product or process may yield substantially different results.

Further according to MPEP 2145, 3rd paragraph:

Rebuttal evidence may include evidence of "secondary considerations," such as "**commercial success, long felt but unsolved needs**, [and] failure of others." *Graham v. John Deer Co.,* 383 U.S. at 17, 148 USPQ at 467. See also, e.g., *In re Piasecke,* 745 F.2d 1468, 1473, 223 USPQ 785, 788 (Fed. Cir. 1984) (commercial success). ***Rebuttal evidence may also include evidence that the claimed invention yields unexpectedly improved properties or properties not present in the prior art. Rebuttal evidence may consist of a showing that the claimed compound possesses unexpected properties.*** *Dillon*, 919 F.2d at 692-93, 16 USPQ2d at 1901… (Emphasis Added)

Please see paragraphs 9 through 13 for a detailed description of how the present invention solves a long felt, but unsolved need for safer and natural fungicides to replace the more toxic materials derived from petroleum products.

The test results cited clearly show that an aqueous emulsion of a fatty acid and a second carboxylic acid (or its salt) that is not a fatty acid along with a carrier and at least one emulsifier provides unexpected superior fungicidal properties when applied to infected plants compared to an emulsion containing only a fatty acid or compared to an emulsion containing only a carboxylic acid that is not a fatty acid. As a result, according to the teaching of *In re Soni*, and according to MPEP 2143, 3rd paragraph, claims 1-6, 10-12 and 15-25 are not obvious in view of the prior art cited in the Office Action.

It should be understood that the above remarks are not intended to provide an exhaustive basis for patentability or concede the basis for the rejections in the Office Action, but are simply provided to overcome the rejections made in the Office Action in the most expedient fashion.

Claims 1-6, 10-12 and 15-25 are currently pending in this application and have been rejected for the reasons discussed above. In view of the above remarks, it is submitted that the present application is now in condition for allowance. The Examiner is requested to allow claims 1-6, 10-12, and 15-25 and pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the undersigned representative by telephone.

Respectfully submitted,

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